

Arc Heater Simulator (ARChES) Toolkit

Completed Technology Project (2017 - 2018)



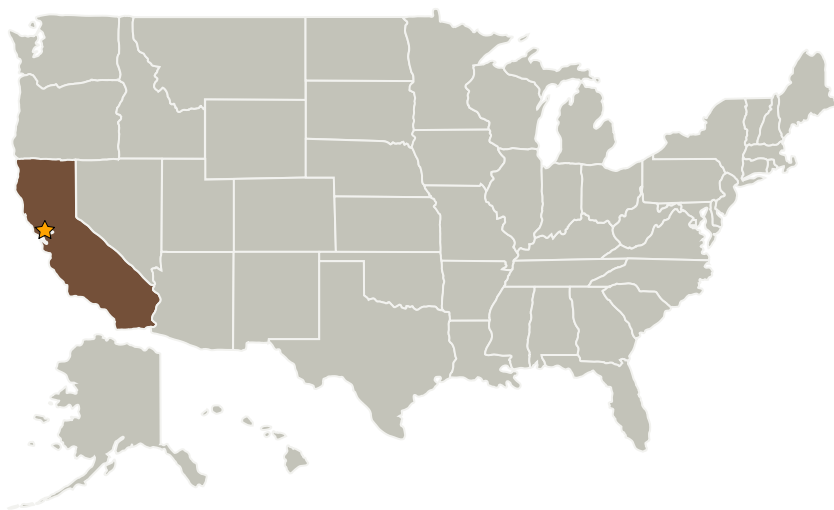
Project Introduction

The effort will build a modern simulation toolkit. We will develop a toolkit that uses modern numerical methods that capture the full geometry including the cathode chamber, constricted column, anode chamber, the nozzle, and the details of the geometry of the electrodes. We will also develop variable gas mixture equilibrium thermochemistry capability that enables flexibility of gas injection, e.g. Argon in the electrode regions and Air in the constricted arc region. We will implement modern turbulence models and couple 3D radiative transport models with realistic opacity tables for variable mixtures to MHD solver.

Anticipated Benefits

NASA is in the process of expanding its ArcJet capability to meet its exploration objectives. A modern high-fidelity modeling tool is needed to explore modifications to the current 60MW facility that may enable meeting NASA's new requirements at a fraction of the cost of a new facility. We plan to develop a high-fidelity model for the arc heater column to simulate the multi-physics in play in the operation of the ArcJet.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Center Innovation Fund: ARC CIF

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Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Harry Partridge

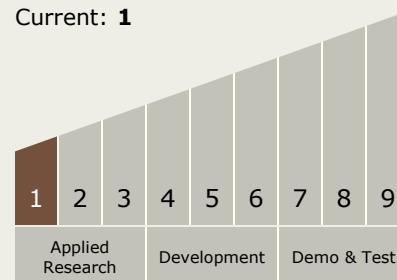
Principal Investigator:

Nagi N Mansour

Technology Maturity (TRL)

Start: 1

Current: 1



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.2 Electric Space Propulsion
 - TX01.2.4 Electrothermal

Target Destination

Foundational Knowledge